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TRANSACTIONS AS KNOWN AND NAMED

FOLLOWING an exhibit in a preceding paper [1] of the extent to which the manner of observing we call "transactional" is being employed in recent physics, we wish now to show something of its entry into physiology. Upon this basis we shall discuss its importance for behavioral inquiry, and we shall especially stress the outstanding need for its employment in inquiries into knowings and knowns as human behaviors, if such inquiries are to achieve success.

A brief reminder of the terminology provisionally employed is desirable. In a natural factual cosmos in course of knowledge by men who are themselves among its constituents, naming processes are examined as the most readily observable and the most easily and practicably studied of all processes of knowing.[2] The name "Fact" is applied to such a cosmos with respect both to its naming-knowing and its named-known aspects. The naming aspect of Fact is styled Designation; the named aspect is styled Event. The problem as to whether knowings-knowns of other forms [3] than namings-nameds should be brought into such inquiry prior to its development is postponed on about the same basis that a biologist proceeds with inquiry into either plant or animal life prior to securing a sharp differentiation between the two or a sharp separation of both of them together from physical event.

The name "Object" is applied to Event well established as the outcome of inquiry. The name "Specification" is applied to that most efficient form of Designation which has developed in the growth of modern science.[4] Transaction is, then, that form of event-specification, i.e., of the named Object, which is becoming more and more importantly employed in the most advanced scientific inquiry, though still grossly disregarded in backward enter-

[1] This JOURNAL, Vol. XLIII (1946), pp. 505–517.

[2] *Ibid.*, Vol. XLII (1945), p. 234, p. 648, pp. 653–657.

[3] These other forms include not only the full range of the perceptive-manipulative (Signal), but also those of non-naming linguistic processes such as mathematics (Symbol).

[4] The word "science" in our use stands for free experimental observation and naming, with the understanding that the advanced branches of scientific inquiry are necessary aids to the backward branches, but never their dictators.

prises, and which is wholly neglected in present-day inquiries into knowledge as the knowings-known procedures of men. Transaction will be discussed in the present paper, Specification in the paper next to follow, and then, at a still later time, the manner of organization we find existing between Definition,[5] Specification, and Transaction, will be examined.

To reduce the occasion for some of the ordinary forms of misunderstanding, and to avoid frequent reminder of them in the text, attention is now called to certain positions common in whole or in large degree to current epistemologies, psychologies, and sociologies. These are positions which are *not* shared by us, and which may *in no case* be read into our work whether pro or con by persons who wish properly to appraise it.

(*a*) We employ no basic differentiation of subject *vs.* object, any more than of soul *vs.* body, of mind *vs.* matter, or of self *vs.* not-self.

(*b*) We introduce no knower to stand over against what is known as if in a different, or superior, realm of being or action; nor any known or knowable as of a different realm to stand over against the knower.

(*c*) We tolerate no "entities" or "realities" of any kind, intruding as if from behind or beyond the knowing-known events, with power to interfere, whether to distort or to correct.

(*d*) We introduce no "faculties" or other operators (however disguised) of an organism's behaviors, but require for all investigation direct observation and usable reports of events, without which, or without the effort to obtain which, all proposed procedure is to be rejected as profitless for the type of enterprise we here undertake.

(*e*) In especial we recognize no names which pretend to be expressions of "inner" thoughts, any more than we recognize names which pretend to be compulsions exercised upon us by "outer" objects.

(*f*) We reject the "no man's land" of words imagined to lie between the organism and its environmental objects in the fashion of most current logics, and require, instead, definite locations for all naming behaviors as organic-environmental transactions under observation.

(*g*) We tolerate no finalities of meaning parading as "ultimate" truth or "absolute" knowledge, and give such purported

[5] "Definition," in our use, is based on Symbol, where "symbol" stands for a highly refined development of language, characteristic primarily of mathematics. Symbol in no case indicates Name or other form of sign except the symbolic in definition.

finalities no recognition whatever under our postulation of natural system for man in the world.

(*h*) To sum up: Since we are concerned with what is inquired into and is in process of knowing as cosmic event, we have no interest in any form of hypostatized underpinning. Any statement that is or can be made about a knower, self, mind, or subject—or about a known thing, an object, or a cosmos—must, so far as we are concerned, be made on the basis, and in terms, of aspects of event which inquiry, as itself a cosmic event, finds taking place.

The preliminary characterization of Transaction in our immediately preceding paper [6] was that it represented that late level in inquiry in which observation and presentation could be carried on without attribution of the aspects and phases of action to independent self-actors, or to independently inter-acting elements or relations. We may now offer several additional characterizations [7] correlated with the preliminary one and indicating the wide range of considerations involved. We may take the ancient, indeed, largely archaic, stages of self-action for granted on the basis of what has already been said of them and subject to the illustrations that will be given hereafter, and we may economize space by confining immediate attention to a comparison of transaction with interaction.

Consider the distinction between the two as drawn in terms of description. If inter-action is inquiry of a type in which events enter under the presumption that they have been adequately described prior to the formulation of inquiry into their connections, then—

Trans-action [8] is inquiry of a type in which existing descriptions of events are accepted only as tentative and preliminary, so that new descriptions of the aspects and phases of events, whether in widened or narrowed form, may freely be made at any and all stages of the inquiry.

Or consider the distinction in terms of names and naming. If inter-action is found where the various objects inquired into enter as if adequately named and known prior to the start of inquiry, so that further procedure concerns what results from the action

[6] This JOURNAL, Vol. XLIII (1946), p. 507.

[7] The reader will recall that in the present treatment we do not hope to get beyond characterization, but must leave the greater accuracy of specification for future development, when additional phases of the issue have been examined.

[8] We shall permit ourselves to continue the free use of capitalization and hyphenation for purposes of emphasis as the contexts may suggest.

and reaction of the given objects upon one another, rather than from the reorganization of the status of the presumptive objects themselves, then—

Trans-action is inquiry which ranges under primary observation across all subject-matters that present themselves, and proceeds with freedom toward the re-determination and re-naming of the objects comprised in the system.

Or in terms of Fact. If inter-action is procedure such that its inter-acting constituents are set up in inquiry as separate "facts," each in independence of the presence of the others, then—

Trans-action is Fact such that no one of its constituents can be *adequately* specified as "a fact" apart from the specification of the other constituents of the full subject-matter.

Or with respect to Elements. If inter-action develops the particularizing phase of modern knowledge, then—

Trans-action develops the widening phases of knowledge, the broadening of system within the limits of observation and report.

Or in terms of Activity. If inter-action views things as primarily static, and studies the phenomena under their attribution to such static "things" taken as bases underlying them, then—

Trans-action regards extension in time to be as indispensable as is extension in space (if observation is to be properly made), so that "thing" is in action, and "action" is observable as thing, while all the distinctions between things and actions are taken as marking provisional stages of subject-matter to be established through further inquiry.

Or with special attention to the case of organism and environment. If inter-action assumes the organism and its environmental objects to be present as substantially separate existences or forms of existence, prior to their entry into joint investigation, then—

Trans-action assumes no pre-knowledge of either organism or environment alone as adequate, not even as respects the basic nature of the current conventional distinctions between them, but requires their primary acceptance in common system, with full freedom reserved for their developing examination.[9]

[9] How much need there is for precision in these respects is well indicated by a paragraph in a recent book on the general characteristics of evolution by one of America's most distinguished biologists. His phrasings were first that "the organism develops . . . structures and functions," next that "the organism becomes adapted to . . . conditions," and finally that "evolution produces . . . etc." First the organism is actor, next the environment is actor, and lastly "evolution" is hypostatized to do the work. And all in a single paragraph. Such phrasings indicate, of course, inattention to the main issues involved.

Or more particularly with specialized attention to knowings and knowns. If, in replacement of the older self-action by a knower in person, inter-action assumes little "reals" interacting with or upon portions of the flesh of an organism to produce all knowings up to and including both the most mechanistic and the most unmechanistic theories of knowledge,[10] then—

Trans-action is the procedure which observes men talking and writing, with their word-behaviors and other representational activities connected with their thing-perceivings and manipulations, and which permits a full treatment, descriptive and functional, of the whole process, inclusive of all its "contents," whether called "inners" or "outers," in whatever way the advancing techniques of inquiry require.

And finally, with respect to inquiry in general. Wherever inter-actional presentation, on the basis of its special successes in special fields, asserts itself dogmatically, or insists on establishing its procedure as authoritative to the overthrow of all rivals, then—

Trans-actional Observation is the fruit of an insistence upon the right to proceed in freedom to select and view all subject-matters in whatever way seems desirable under reasonable hypothesis, and regardless of ancient claims on behalf of either minds or material mechanisms, or any of the surrogates of either.[11]

Thoroughly legitimate interactional procedures, it will be recalled from our previous discussion,[12] are all those which, like

[10] Descartes, in his discussion of vision in the first five or six chapters of his *Dioptrique*, gives a fascinating account of sensation as mechanistically produced. It should be specially valuable to modern laboratory workers in the field since it lacks the ordinary protective jargon of professional life, and gets down to the verbal bone of the matter. Descartes was far from liking it in its full application, but in the case of vision, he did not see how he could avoid its apparatus of tubes, rods, and animal spirits.

[11] The reader of philosophical specialization may be interested in comparing Kant's substance, causation, and reciprocity. Cassirer's substance and function has interest so far as he develops it. The words "analysis" and "synthesis" suggest themselves, but a cursory survey of discussions in that form has shown little of interest. More suggestive, perhaps, for the philosophical specialist, is the now almost wholly discarded "objective idealism" of men like Green, Bradley, and Caird. The basic terminology of this group of men, using "absolute mind" as a starting point, may be stripped off so as to open the way to see more clearly what they were practically seeking. They show us a full system of activity, a dislike for crude dualisms, and a desire to get rid of all such breakages as the epistemologies capitalize. Along with this went a tolerance for, and even an interest in, the growth, and in that sense the "life," of the system itself. Our own development, of course, in contrast, is of the earth earthy, representing strictly an interest in improved methods of research, for whatever they are worth here and now.

[12] This JOURNAL, Vol. XLIII (1946), pp. 510–511.

classical mechanics, are held adequately within their frameworks of hypothesis; and also those others which represent provisional partial selections of subject-matters with recognition of the need for later statement in wider system. Abuses of interactional procedure are found, on the other hand, in the endeavors now happily fast disappearing, to force classical mechanistic control upon other enterprises of inquiry; and in the many quasi-interactional mixtures of diluted self-actors and pseudo-particles which remain largely in control of inquiry in the psychologies, sociologies, and epistemologies.

If we turn now to consideration of the biological fields of inquiry we find that much, but not all, of the old-fashioned self-actional has been discarded. The "vital principle" is an outstanding illustration. Employed until recent decades to mark the distinction of "life" from "mechanism," it proved in the end to amount to nothing more than a sort of honorific naming. What is left of it, where not a mere appendage to some irrelevant creed, is mostly found lurking in obscure corners, or entering by way of incidental implication. Today the marvelous descriptions we possess of living processes provide adequate differentiation from the very different, even if themselves equally marvelous, descriptions of physical processes. The orthogenesis of Henry Fairfield Osborn sought to read "direction" into evolutionary lines with the implication of "control," but more and more today, despite his elaborate exhibits, biologists hold that developed description by itself is a far more useful "interpretation" than any appeal to "directives." [13]

Today we find transactional as well as interactional procedures used in the *details* of physiological and biological inquiry; but for *general* formulations we find little more than preliminary approaches to the transactional. This is seen on the large scale in the heavily theoretical separation that is maintained between the organism and the environment and the attribution of many activities to the former as if in independence.[14] As over against the

[13] Osborn's use of the word "interaction" is characteristically in contrast with ours. In developing his "energy" theory in his book *The Origin and Evolution of Life* (1917) he considered action and reaction as taking place mostly simultaneously between the parts of the organism, and then added interaction as an additional something connecting non-simultaneous actions and reactions. Interactions therefore appeared as a new product controlling the others, illustrated by such forms as instincts, functions of coördination, balance, compensation, coöperation, retardations, accelerations, etc. The "directing power of heredity" was thus set forth as "an elaboration of the principle of interaction" (pp. 4–6, 15–16).

[14] A prevailing type of logical reflection of this older attitude towards the organism will be found in Carnap's assertion that "It is obvious that

vitalisms the "cell theory" in its radical form stands as a representative of interactional treatment. Views of the type called "organismic," "organismal," etc., except where they contain reminiscences of the old *self*-actional forms, stand for the transactional approach intra-dermally. Such special names as "organismic" were felt to be needed largely because the word "organic," which could serve as an adjective either for "organism" or for "organ," had been too strongly stressed in the latter usage. Transactional treatment, if dominant, would certainly desire to allot the leading adjective rather to the full living procedure of the organism than to minor specialized processes within it; and if ancillary adjectives were needed as practical conveniences, then it would adapt them to the ancillary inquiries in interactional form.[15] The anticipated future development of transdermally transactional treatment has, of course, been forecast by the descriptive spade-work of the ecologies, which have already gone far enough to speak freely of the evolution of the habitat of an organism as well as of the evolution of the organism itself.

The history of the cell in physiology is of great significance for our purposes. For almost a hundred years after Schleiden and Schwann had systematized the earlier scattered discoveries about it,[16] the cell was hailed as the basic life unit. Today there are only limited regions of physiological report in which the cell retains any such status. What the physiologist sees in it is not

the distinction between these two branches [physics and biology] has to be based on the distinction between *two kinds of things* which we find in nature: organisms and nonorganisms. Let us take this latter distinction as granted" (*Logical Foundations of the Unity of Science, International Encyclopedia of Unified Science*, Vol. I, No. 1, p. 45; italics not in the original). As against this rigidified manner of approach compare the discussion of the organism and behavior in John Dewey's *Logic, the Theory of Inquiry*, pp. 31–34.

[15] For the intra-organic transactional observation, with occasional still wider envisionments, see the works of J. v. Uexkull, W. E. Ritter, and Kurt Goldstein. Lawrence J. Henderson's book *The Fitness of the Environment* should also be examined. Ritter lists among the most forceful of the earlier American advocates of the "organismal theory" as against the extreme forms of the "cell theory" C. O. Whitman, E. B. Wilson, and F. R. Lillie. Goldstein refers in biology to Childs, Coghill, Herrick, and Lashley; in psychiatry to Adolf Meyer and Trigant Burrow; in psychology to the *Gestalt* school; and adds references in philosophy to Dilthey, Bergson, Whitehead, and Dewey. Henderson, with reference to Darwin's "fitness," says that "it is a mutual or reciprocal relationship between the organism and the environment," and again that "the fitness of the environment is both real and unique" (*op. cit.*, p. xi, pp. 267–271).

[16] For the slow process of identifying the cell as distinctive structure, see the discussion by E. B. Wilson in *The Cell in Development and Heredity*, 3d ed. (1937), pp. 2–4.

what it is, or is supposed to be "in itself," but what it is within its actual environment of tissues. Some types of inquiry are readily carried on in the form of interactions between one cell and other cells. So far as this type of treatment proves adequate for the work that is in hand, well and good. But other types of inquiry require attention in which the interactional presentation is not adequate, and in which broader statements must be obtained in full transactional form, in order to secure that wider conveyance of information which is required. One can, in other words, work with cells independently, or with cells as components of tissues and organs; one can put organs into interaction, or one can study the organs as phases of organisms. Biographical treatment of the "organism as a whole" may or may not be profitable. If it is not, this is usually not so much because it fails to go deeply enough into cellular and organic details, as because it fails to broaden sufficiently the organic-environmental setting and system of report. Its defect is precisely that it centers much too crudely in the "individual" so that whether from the more minute or from the more extended viewpoint, the "individual" is precariously placed in knowledge, except as some reminiscence of an ancient self-actional status is slipped in to fortify it for those who accept that kind of fortification.

The gene, when it was first identified by name and given experimental study "on suspicion," seemed almost as if it held the "secret of life" packed into its recesses. Laboratory routine in genetics has become stylized, and is today easy to carry on in standard forms. The routine experimenter who emerges from its interesting specialties and lifts his voice as a radio pundit is apt to tell us all in a single breath, unabashed, that many a gene lives a thousand generations unchanged, and that each new-born organism has precisely two genes of each and every kind in each and every cell, one from each parent. One wonders and hunts his textbooks on grammar and arithmetic. But under wider observation and broader viewpoints we find little of that sort of thing. With gene-position and gene-complex gaining steadily increased importance for interpretative statement, the gene, like many a predecessor that has been a claimant for the rank of element or particle in the universe, recedes from its claims to independence *per se,* and becomes configurational within its setting. The genetic facts develop, but the status of self-actor attributed to the gene at the start proves to be a "fifth-wheel" characteristic: the physiological wagon runs just as well without the little genetic selves—indeed, all the better for being freed from their needless encum-

brance.[17] In much the way that in the preceding paper we employed a recent interpretive book in the physical range, for the significance of its wordings rather than for fixation of authority, we may here cite from Julian Huxley's *Evolution, the Modern Synthesis* (1942). We are told: "Genes, all or many of them, have somewhat different actions according to what neighbors they possess" (p. 48); "The effect produced by any gene depends on other genes with which it happens to be cooperating" (p. 65); "The environment of the gene must include many, perhaps all other genes, in all the chromosomes" (p. 65); "The discreteness of the genes may prove to be nothing more than the presence of predetermined zones of breakage at small and more or less regular distances along the chromosomes" (p. 56); "Dominance and recessiveness must be regarded as modifiable characters, not as unalterable inherent properties of genes" (p. 83); "To say that rose-comb is inherited as a dominant, even if we know that we mean the genetic factor for rose-comb is likely to lead to what I may call the one-to-one or billiard-ball view of genetics" (p. 19); "This crude particulate view . . . of unanalyzed but inevitable correspondence . . . is a mere restatement of the preformation theory of development" (p. 19). We have here clear illustration of the newer feeling and newer expression for physiology comparable to that of other advanced sciences.[18]

Organisms do not live without air and water, without food ingestion and radiation. They live, that is, as much in processes across and "through" skins as in processes "within" skins. One might as well study an organism in complete detachment from its environment as try to study an electric clock on the wall in disregard of the wire leading to it. Reproduction, in the course of human history, has been viewed in large measure self-actionally (as fiction still views it) and then interactionally. Knowledge of a sexual reproduction was an influence leading to re-interpretation

[17] Incidentally this superfluity exemplifies the position we are taking throughout our entire discussion: Why retain for the purpose of general interpretation "entities" (i.e., supposititious things-named that no longer figure in actual inquiry, nor in adequate formulation of its results? Why not get rid of such items when worn out and dying, instead of retaining their sepulchral odor till the passing generations cause even the latter to die away? The split of "nature" into two "realms"—two superfluities—is the instance of such entitative survival to which we elsewhere find it necessary to give ever-renewed consideration.

[18] The results secured by R. Goldschmidt and Sewall Wright should also be compared. For the former, see his *Physiological Genetics* (1938). For the latter see "The Physiology of the Gene," *Physiological Reviews*, Vol. XXI (1941).

on a fully racial basis, and recent dairy practices for insemination make the transdermally transactional appearance almost the simple, natural one.

Ecology is full of illustrations of the interactional (where the observer views the organism and the environmental objects as if in struggle with each other); and it is still fuller of illustrations of the transactional (where the observer lessens the stress on separated participants, and sees more sympathetically the full system of growth or change). The issue is not baldly that of one *or* the other approach. It is not even an issue as to which shall be the basic underlying construction—since foundations in general in such questions are much less secure than the structures built upon them.[19] It is, in view of the past dominance of the interactional procedure in most scientific enterprise, rather an issue of securing freedom for wider envisionment.

The development of taxonomy since Linnaeus throws much light on the lines of change. He brought system and order among presumed separates. The schematism of taxonomy has at times sought rigidity, and even today still shows such tendencies among certain diminishing types of specialists. The very wording of Darwin's title, *The Origin of Species*, was a challenge, however, to the entire procedure of inquiry as it had been carried on for untold years. Its acceptance produced a radical change in taxonomic understanding—a method which rendered imperative observation across extended spatio-temporal ranges of events previously ignored. Taxonomy now tends to flexibility on the basis of the widened and enriched descriptions of advancing knowledge.[20]

The distinction of transactional treatment from interactional —the latter often with surviving traces of the self-actional—may be seen in the way the word "emergence" is often used. At a stage at which an inquirer wants to keep "life," let us say, within

[19] Georg Simmel, *Soziologie: Untersuchungen über die Formen der Vergesellschaftungen*, Zweite Auflage, 1922, p. 13.

[20] E. Mayr, *Systematics and the Origin of Species*, 1942. The author (pp. 113–122) offers a highly informative account of the learning and naming issues in biological nomenclature, ranging from the "practical devices" of the systematist to the "dynamic concepts" of the evolutionist, and compares a variety of treatments including the morphological, the genetic, the biological-species, and the criterion of sterility. His discussion moves back and forth between the natural processes of naming and the facts-in-nature to be named. When we come later to discuss characterization, description, and specification, it will be evident (1) that the account can be given from the point of view of either aspect, and (2) that the recognition of this very complementarity is basic to our whole procedure. The twenty-two essays in the volume *The New Systematics* (1940) edited by Julian Huxley also furnish much material for profitable examination in this connection.

"nature," at the same time not "degrading" it to what he fears some other workers may think of "nature"—or perhaps similarly, if he wants to treat "mind" within organic life—he may say that life or mind "'emerges," calling it thereby "natural" in origin, yet nevertheless still holding that it is all that it was held to be in its earlier "non-natural" envisionment. The transactional view of emergence, in contrast, will not merely expect to report the advent out of the womb of nature of something that still retains an old non-natural independence and isolation. It will be positively interested in fresh direct study in the new form. It will seek enriched descriptions of primary life processes in their environments and of the more complex behavioral processes in theirs. It is, indeed, already on the way to gain them. The advances in the transactional direction that we can note in biological inquiries, while, of course, not as yet so striking as those in physical sciences, are nevertheless already extensive and important.

We have considered physiological inquiry in transactional forms and we have mentioned, in passing, other biological inquiries such as those concerning trends of evolution, adaptations, and ecologies. We turn now to the wide ranges of adaptive living called behaviors, including thereunder all of the psychological and all of the sociological among human beings, and embracing particularly all of their knowings and all of their knowns. If physiology can not successfully limit itself to the interactions between one component of living process within the skin and other components within it, but must first take a transactional view within the skin and then follow this with allowance for transdermal process, then very much more strongly may behavioral inquiries be expected to show themselves as transdermally transactional.[21] Manifestly[22] the subject-matters of behavioral inquiries involve organism and environmental objects jointly at every instant of their occurrence, and in every

[21] See Bentley, "The Human Skin: Philosophy's Last Line of Defense," *Philosophy of Science*, Vol. 8 (1941), pp. 1–19. Compare J. R. Firth, *The Tongues of Men*, London, 1937, pp. 19–20. "The air we talk and hear by, the air we breathe, is not to be regarded as simply outside air. It is inside air as well. We do not just live within a bag of skin, but in a certain amount of space which may be called living space which we continue to disturb with some success. And the living space of man is pretty wide nowadays. Moreover we never live in the present." "In dealing with the voice of man we must not fall into the prevalent habit of separating it from the whole bodily behaviour of man and regarding it merely as a sort of outer symbol of inward private thoughts."

[22] This is "manifest," of course, only where observation has begun to be free. It is far from manifest where ancient categories and other standardized forms of naming control both the observation and the report.

portion of space they occupy. The physiological setting of these subject-matters, though itself always transactionally organic-environmental, submits itself to frequent specialized investigations which, for the time being, lay aside the transactional statement. The behavioral inquiries, in contrast, fall into difficulties the very moment they depart from the transactional, except for the most limited minor purposes; their traditional unsolved puzzles are indeed the outcome of their rejecting the transactional view whenever it has suggested itself, and of their almost complete failure to allow for it in any of their wider constructions. The ancient custom, of course, was to regard all behaviors as initiated within the organism, and at that not by the organism itself, but rather by an actor or resident of some sort—some "mind," or "psyche," or "person" attached to it—or more recently at times by some "neural center" imitative of the older residents in character. The one-sided inadequacy of this view is what, so often, has called out an equally one-sided opposed view, according to which the organism is wholly passive, and is gradually moulded into shapes adapted to living by independent environmental conditions, mechanistically treated. Both of these views, one as much as the other, are alien to us.

Summing up positions previously taken, we regard behaviors as biological in the broad sense of that word just as much as are any other events which biologists more immediately study. We nevertheless make a technical,—indeed almost a technological—distinction between physiological and behavioral inquiries comparable to the technical distinction between physical and physiological. This is simply to stress the difference in the procedures one must use in the respective inquiries, and to note that the technical physiological statement, no matter how far it is developed, does not directly achieve a technical behavioral statement. One may, in other words, take into account all known physical procedures about the moon, and likewise all known physiological procedures of the human body, and yet not arrive, through any combination or manipulation whatsoever, at the formulation, "rustic, all agape, sees man in moon." This last needs another type of research, still "natural," but very different in its immediate procedures. The distinction is never one of "inherent materials," nor one of "intellectual powers," but always one of subject-matter at the given stage of inquiry.[23]

[23] This JOURNAL, Vol. XLII (1945), pp. 239–245, and especially p. 240. We do not make a comparable distinction between psychological and sociological inquiries. This latter distinction is standard among "self-actional" treatments, where the "individual" enters in traditional exaggeration; and

As for the self-actional treatment of behaviors (much of which still remains as a heritage of the past in the laboratories) it is probably safe to say that after physicists knocked the animism out of physical reports, the effect was not to produce a comparable trend in organic and behavioral fields, but just the reverse. All the spooks, fairies, essences, and entities that once had inhabited portions of matter now took flight to new homes, mostly in or at the human body, and particularly the human brain. It has always been a bit of a mystery as to just how the commonplace "soul" of the Middle Ages, which possessed many of the Aristotelian virtues as well as defects, came to blossom out into the over-strained, tense, and morbid "psyche" of the last century or two. To Descartes, whether rightly or wrongly, has fallen much of the blame. The "mind" as "actor," still in use in present-day psychologies and sociologies, is the old self-acting "soul" with its immortality stripped off, grown dessicated and crotchety. "Mind" or "mental," as a preliminary word in casual phrasing, is a sound word to indicate a region or at least a general locality in need of investigation; as such it is unobjectionable. "Mind," "faculty," "I. Q.," or what not as an actor in charge of behavior is a charlatan, and "brain" as a substitute for such a "mind" is worse. Such words insert a name in place of a problem, and let it go at that; they pull out no plums, and only say! "What a big boy am I!" The old "immortal soul" in its time and in its cultural background made some sense because of the "immortal," not because of the "soul."[24] But its modern derivative, the "mind," is redundant. The living, behaving, knowing organism is present. To add a "mind" to him is to try to double him up. It is just double-talk. And double-talk doubles no facts.

Interactional replacements for self-actional views have had minor successes, but have produced no generally usable constructions. This is true regardless of whether they have presented the

it is customary in most interactional treatments. Transactionally viewed, a widening or narrowing of attention is about all that remains indicated by such words as "social" and "individual." As we have elsewhere said, if one insists on considering individual and social as different in character, then a derivation of the former from the latter would, in our judgment, be much simpler and more natural than an attempt to produce a social by joining or otherwise organizing presumptive individuals. In fact most of the talk about the "individual" is the very finest kind of an illustration of isolation from every form of connection carried to an extreme of absurdity that renders inquiry and intelligent statement impossible.

[24] The historical differentiations between spirit, soul, and body throw interesting light on the subject. Any large dictionary will furnish the material.

organic inter-actors which they set over against physical objects in the form of minds, brains, ideas, impressions, glands, or images themselves created in the image of Newtonian particles. Despite all the fine physiological work that has been done, behavioral discussions of vision in terms of images of one kind or another are in about as primitive a state as they were a hundred years ago.[25] The interactional treatment, as every one is aware, entered psychological inquiry just about the time it was being removed from basic position by the physical sciences from which it was copied.[26]

The trans-actional point of view for behaviors, difficult as it may be to acquire at the start, gains freedom from the old duplicities and confusions as soon as it is put to firm use. Consider ordinary everyday behaviors, and consider them without subjection to either private mentalities or particulate mechanisms. Consider closely and carefully the reports we make upon them when we get rid of the conversational and other conventional by-passes and short-cuts of expression.

If we watch a hunter with his gun go into a field where he sees a small animal already known to him by name as a rabbit, then, within the framework of half an hour and an acre of land, it is easy—and for immediate purposes satisfactory enough—to report the shooting that follows in an interactional form in which rabbit and hunter and gun enter as separates and come together by way of cause and effect. If, however, we take enough of the earth and enough thousands of years, and watch the identification of rabbit

[25] For example, Boring in *A History of Experimental Psychology* (1929), p. 100, speaking of the work of Johannes Mueller, writes: "In general Mueller remains good doctrine today, although we know that perceived size is neither entirely relative nor entirely proportional to visual angle." This despite the fact that he had ascribed to Mueller the view that "It is the retina that the sensorium perceives directly," and added that "it is plain that for Mueller the theory of vision is merely the theory of the excitation of the retina by the optical image." This is perhaps mainly carelessness in statement, but what a carelessness!

[26] The recent work of Egon Brunswik goes as far, perhaps, on the trans-actional line as any. He recently ("Organismic Achievement and Environmental Probability," *Psychological Review*, Vol. 50, 1943, p. 259n) suggested coupling "psychological ecology" with "ecological psychology" in what seemed a functional manner from both sides. In contrast Kurt Lewin, speaking at the same meeting, suggested the name "ecological psychology" but rather for the purpose of getting rid of factors undesirable in his mentalistically fashioned "life-space" than for improvement of system. Clark Hull, also on the same program, holds that organic need and organic environment must be "somehow jointly and simultaneously brought to bear" upon organic movement (the phrasing from his book *Principles of Behavior*, 1943, p. 18, where he italicizes it) and he bridges across the gap by series of intervening variables of a fictional, pseudo-logical character.

gradually taking place, arising first in the sub-naming processes of gesture, cry, and attentive movement, wherein both rabbit and hunter participate, and continuing on various levels of description and naming, we shall begin to see the transactional account as the one that best covers the ground. This will hold not only for the naming of hunter, but also for accounts of his history back into the pre-human and for his appliances and techniques. No one would be able successfully to speak of the hunt*er* and the hunt*ed* as isolated with respect to hunt*ing*. Yet it is just as absurd to set up hunt*ing* as event in isolation from the spatio-temporal connection of all the components.

A somewhat different type of illustration will be found in the comparison of a billiard game with a loan of money, both taken as events. If we confine ourselves to the problem of the balls on the billiard table, they can be profitably presented and studied interactionally. But a cultural account of the game in its full spread of social growth and human adaptations is already transactional. And if one player loses money to another we can not even find words in which to organize a fully interactional account by assembling together primarily separate items. Borrower can not borrow without lender to lend, nor lender lend without borrower to borrow, the loan being a transaction that is identifiable only in the wider transaction of the full legal-commercial system in which it is present as event.

In ordinary everyday behavior, in what sense can we examine a talking unless we bring a hearing along with it into account? Or a writing without a reading? Or a buying without a selling? Or a supply without a demand? How can we have a principal without an agent or an agent without a principal? We can, of course, detach any portion of a transaction that we wish, and secure provisional descriptions and partial reports. But all this must be subject to the wider observation of the full process. You can have a physical interpretation of sounds on the moon, but no linguistic interpretation there unless there is *language* to interpret. And language requires praticipants. Even if sounds on the moon match Yankee Doodle in intensity, pitch, and timbre, they are not Yankee Doodle by "intrinsic nature," in the twentieth century, whatever they might have been thought to be in the Dark Ages, or may perhaps be thought to be today by echoistic survivals of those days;[27] they need action if they are to yankeedoodle at all.

[27] Echolatry might be a good name to apply as a group to some of our most solemn and persevering remembrancers of things past—and done with. "Echoist," by the way, is a good word in the dictionaries, and should not be wholly lost from sight.

When communicative processes are involved, we find in them something very different from physiological process; the transactional inspection must be made to display what takes place, and neither the particles of physics nor those of physiology will serve. Many a flint chip fools the amateur archaeologist into thinking it is a flint tool; but even the tool in the museum is not a tool in fact except through users of such tools, or with such tool-users brought into the reckoning. It is so also with the writing, the buying, the supplying. What one can investigate a thing *as*, that is what it *is*, in Knowledge and in Fact.

When we come to the consideration of the knowings-knowns as behaviors, we find Self-Action as the stage of inquiry which establishes a knower "in person," residing in, at, or near the organism to do (i.e., to perform, or have, or be—it is all very vague) the knowing. Given such a "knower," he must have something to know; but *he* is cut off from it by being made to appear as a superior power, and *it* is cut off from *him* by being made to appear just as "real" as he is, but of another "realm."

Interaction, in the interpretation of knowings, is a somewhat later stage which assumes actual "real" things like marbles which impinge on certain organic regions such as nerve endings or perhaps even brain segments. Here we still have two kinds of "reals" even though superficially they are brought somewhat closer together in physical-physiological organization. The type of connection is superficial in this case because it still requires a mysticism similar to that used for self-actions to bridge across from the little real "thing" to the little "real" sensation as organic, psychic, or psychologic—where by the word "mysticism" is meant nothing "mystic" itself, but merely some treatment that does not yield to description, and quite often does not want to.

The transactional presentation is that, we believe, which appears when actual description of the knowledge process is undertaken on a modern basis. At any rate it is the kind of presentation which has resulted from our own attempts at direct observation, description, and naming; it is for aid in appraising our results that we have, in this present paper and the one immediately preceding it, examined comparable procedures in other scientific fields and upon other scientific subject-matters. The steps we have taken, it will be recalled, are to say that we can not efficiently name and describe except through observation; that the word "knowledge" is too broadly and vaguely used to provide a single subject-matter for introductory inquiry; that we can select as a compact subject-matter within "knowledges" generally the region of knowings-

through-namings; that here observation at once reports that we find no naming apart from a named, and no named apart from a naming, such that we can use it as direct subject of *behavioral* inquiry—whatever physical or physiological observations we can incidentally make on the namings and the nameds in provisional separations; that such observations in fused systems *must* be steadily maintained if we are to attain complete behavioral report; and that if this procedure requires an envisionment for behavioral purposes of space and time that is more extensive and comprehensive than the earlier physical and physiological reports required, then such envisionment is what we must achieve and learn to employ.

The outcome of self-actional and interactional procedures, so far as any competent theory of knowledge is concerned, has been and still is chaos, and nothing more. One can easily "think of" a world without a knower, or perhaps even of a knower without a world to belong to, and to know. But all that "think of" means in such a statement is "to mention in crude language," or "to speak crudely." The hypostatizing fringes of language are what make this "easy." While "easy," it is nevertheless not "possible," if "possible" covers carrying through to a finish, and if "think" means sustained consideration that faces all difficulties, holds to coherent expression, and discards manifestly faulty experimental formulations wherever and whenever it finds them—in short, if the "thinking" strives to be "scientifically" careful. A "real world" that has no knower to know it, has, so far as human inquiry is concerned (and this is all that concerns us), just about the same "reality" that has the palace that in Xanadu Kubla Kahn decreed. (That, indeed, has had its reality, but it was not a reality beyond poetry, but in and of it.) A knower without anything to know has perhaps even less claim to reality than that. This does not deny the geologic and cosmic world prior to the evolution of man within it. It accepts such a world as known to us, as within knowledge, and as with all the conditionings of knowledge; but it does not accept it as something superior to all the knowledge there is of it. The attribute of superiority is one that is, no doubt, "natural" enough in its proper time and place, but it too is "of and in" knowledge, not "out of" or "beyond."[28] In other words, even these knowings are transactions of knowing and known jointly; they themselves as knowings occupy stretches

[28] Many a man is confident in saying that he knows for certain (and often with a very peculiar certainty) what is behind and beyond his personal knowings. We are well aware of this. Nevertheless we do not regard it as good practice in inquiry when dependable results are sought.

of time and space as much as do the knowns of their report; and they include the knower as himself developed and known within the known cosmos of his knowledge.

How does it come to pass, one may ask, if the naming-named transaction as a single total event is basic as we say it is, that historically our language has not long since developed adequate special naming for just this basic process itself. The answer lies partially in the fact that, so far as ordinary conversational customs are concerned, it frequently happens that the most matter-of-fact and commonplace things are taken for granted and not expressly written down. For the rest of the answer, the part that concerns the professional terminology of knowledge and of epistemology, the sad truth is that it has long been the habit of the professionals to take words of the common vocabulary, stiffen them up somewhat by purported definition, and then hypostatize "entities" to fit. Once given the "entities" and their "proper names," all factual contact, including carefully managed observation, defaults. The names ride the range (in the west) and rule the roost (in the east). All too often the bad names get crowned, while the good names get thumbs down. The regions in which this happens are largely those in which procedure is governed by the grammatical split between the subject and the object of the sentence rather than by observation of living men in living linguistic action. In such theoretical interpretations an unobservable somewhat has been shoved beneath behavioral naming, so that "naming as such" is personified into a ready-made faculty-at-large simply waiting for entities to come along for it to name; though most regrettably without that supernatural prescience in attaching the right name to the right animal which Adam showed in the Garden of Eden. The absurdity is thus standardized; after which not merely epistemology but linguistics, psychology, sociology, and philosophy proceed to walk on artificial legs, and wobbly-creaky legs at that. Turn the subject and object of the sentence into disconnected and unobservable kinds of entities, and this is what happens.

The organism, of course, seems in everyday life and language to stand out strongly apart from the transactions in which it is engaged. This is superficial observation. One reason for it is that the organism is engaged in so many transactions. The higher the organism is in the evolutionary scale, the more complicated are the transactions in which it is involved. Man especially is complex. Suppose a man engaged in but one transaction and that with but one other man, and this all his life long; would he be viewed in distinction from that transaction or from that other man? Hardly. Much analysis, if an analyzer existed, would at least be necessary

to separate him out as a constituent of what went on. A "business man" would not be called a business man at all if he never did any business; yet the very variety of his other transactions is what makes it easy to detach him and specialize him as a "business man." Consider the great variety of his other transactions, and it becomes still easier to make "a man" out of him in the sense of an "essence" or "substance," or "soul" or "mind," after the pattern demanded by the general noun. He comes thus, in the end, to be considered as if he could still be a man without being in *any* transaction. It is precisely modern science which reverses this process by driving through its examinations more thoroughly. When actions were regarded as separate from the actor, with the actor regarded as separate from his actions, the outcome, individually and collectively, was to bring "essence" into authority. The procedures of Galileo, Newton, and Darwin, steadily, bit by bit, have destroyed this manner of observation; and the procedures that must follow hereafter will complete it for the most complex human behavioral activities. They will reverse the old processes and bring the transactions into more complete descriptive organization without the use of either self-actional powers, or interactional "unalterable particles" behind them.[29]

JOHN DEWEY
ARTHUR F. BENTLEY

A METHODOLOGICAL INVESTIGATION INTO THE RELATION BETWEEN MIND AND BODY

I SHALL not investigate the question of the mind-body relation in this paper on an ontological basis, but rather make a methodological approach to the problem. This means that the disquisition will deal, not with the question whether there is a real relation between mind and body, but primarily with the question as to what leads us to the belief that there is such a relation. This may, of course, shed a significant light on the ontological aspect of the problem. To do so, we must first consider a basic question: how do we get our knowledge of "the mental" and of "the body"?

It is clear that the sources of our knowledge in these two cases differ and have nothing in common. We get our knowledge of "the mental" by means of introspection and in no other way. This is obviously a certain method of knowing. If we use another method, that of sense observation, we can never discover anything mental or immaterial. As for our body, we come to know it in the same way as we know other "external" things, by the method of sense

[29] See page 560 for the footnote.

observation. We know our body because we can touch, see, and hear it; otherwise we should never know that we have a body. It should therefore be borne in mind that we arrive at the knowledge of "the mental" and "the body" by two entirely different methods. Now to speak of a relation between "mind" and "body" suggests that there is some uniform source or method of knowing that yields knowledge of the two, and that the concept of the relation between them follows from it. But this is a grave error leading to interminable confusions. When we speak of this relation, we are really compounding *ipso facto* two bodies of knowledge of a heterogeneous character, stemming from heterogeneous sources, and then inferring the relation. But in order to do this, we use the results of two heterogeneous methods of cognition in a single process of inquiry, and shift from one method to the other during that process. It is the compounding of these two different sets of knowledge that must be considered methodologically inadmissible. It leads to grave confusions and contradictions, such as, for instance, the view that there is an "interaction" between the material and immaterial, or a "causality" between what is a material non-entity and a material object, etc.

Both methods, that of sense observation and that of introspection, might be legitimate in their own right, if used consistently and for a given whole field of knowledge. But we must come to grief if we use arbitrarily certain results of the one method and certain results of the other, and then try to piece together a consistent whole out of these two heterogeneous sources.

We see clearly the duality of intro- and extrospection, and once we become aware of it, we must be consistent in the use of these two methods. We may use the method of introspection. When doing so we get something called "mind," but after having done so we should proceed on the same introspective plane. We shall then get no "body" and no world at all. Then it will follow that all things are impressions of that "mind" and nothing else. There may even be "remembrances," but no material objects in the common sense of the word, no "objects." Or we must adopt the empirical method. Then we shall have objects but no "mind." The "mind" arises as an inference when we try to fit things or objects into our ability to remember, and therefore assume a carrier of this ability, which really has bodily characteristics such as spatiality (localization) and temporality (changeability) without being a body: it is a hybrid creation with all the seeds of contradiction and confusion in it. We can not use for one part of the world our senses, and for another introspection or recall, and then ask about their relation. This is a question as to how the

world that I see with my eyes is related to what I remember without using eyes, and how my general awareness is related to the things I am aware of. Those who debate this question mostly speculate as to what the "being aware," which can not be accessible to vision, would look like if it were looked at. Would it look like being liquid or solid or would it not? Their reasoning runs roughly along these lines: Even if we could cut the brain in two (without any lesion, of course), we should never see "awareness," but only material processes. Therefore "awareness" is something additional to these processes—which is obviously an arbitrary conclusion, because awareness will of course never be seen, since it is in the internal (or introspective) dimension of things, and we shall always see or remain with our eyes (extrospectively) in the external dimension.

A consistent uniformity of method would lead to consistent results without contradictions. When using the method of introspection, we should remain within its limits, and then be confined to an "awareness" patterned with feelings and impressions all mental, but there would be no "world of things" on this plane, and therefore also no relation between "the mental" and "the bodily." When using the method of observation or extrospection, we would get a world of objects, but never encounter any "mind." Introspection, however, should be entirely excluded in the latter event, not partly asserted, and supplemented surreptitiously by something gained through observation and amalgamated with it. In the event of the consistent use of a single method, the result would be clear: if there were "mind," there would be no world, and if there were a world, there would be no mind. This is the real alternative facing us, and we must take our choice.

All we have are two directions of inquiry, which do not exist on the level of ingenuousness. To see the "mind" that is a part of the world or reality—in terms of introspection and immateriality—is the reflective view, while to see it in terms of materiality constitutes a view achieved by a different method. The possibility of these two views arises at a certain moment of human reflectivity, when we abandon the ingenuousness. But if we neglect the basic fact of bifurcation, of epistemic direction and method, and compound the world by piecing together entities—or fragments of a heterogenous kind—gained by the two opposing methods, we are obstructed by paradoxes, since we may add an entity gained from the one point of view to the same entity gained by the other point of view, and then say that we have two entities, and ask how they are "related," which may be a senseless question. We can, of course, never be aware which part of the observable world cor-

responds to what we call "mind"—and it may correspond to some such part—nor do we know whether and which part of that "mind" corresponds to some part of the observable world. The most nonsensical assumption might be that which claims that at a given moment some part of the extrospected world is being "transformed" into the introspected one; since here the duplication is most evident, and since a sort of addition of the two elements in an obvious spatial order is created or assumed, where there might be nothing else than a single element, and the relation then would be merely one of "inner" and "outer," which is a denial of spatiality and duplication. In other words, the moment of the assumed "transformation" from the physical to the psychical is merely the moment of change of our epistemic direction or viewpoint, from the "external" picture to the "internal" picture of a thing, or from extro- to introspection—but the thing in question must not be changed or transformed thereby objectively.

It is obvious that the method of introspection can not tell the "whole story," since it never contacts the observable world, nor can observation achieve the task, because it reaches outside, and the combination of the two methods is equally impotent, since the two bifurcate into opposite directions without connection between them. But if such combination is attempted, then logical paradoxes arise. The question of the relation between "mind" and "body" is really the epistemological problem about the relation between intro- and extrospection, and about the possible achievements of the two methods. The solution of this problem would solve the question of the relation between mind and body. But if introspection should yield basically no more than a recording of past observations, its uses would be very limited. The indiscriminate partial use, however, of both observation and introspection during one process of inquiry creates the danger of duplication of one phenomenon seen by two different methods of cognition. The results of two epistemic viewpoints are then regarded erroneously as two different entities. Awareness of "things" is then added to the "things," and it is concluded that "awareness" is also a "thing." The position is similar to that of a man who first smelled two apples, and then saw the same apples with his eyes open, and then concluded that there were four apples in the room, two smelled and two seen apples.

There are only two current instances of the assumed relation between mind and body: (1) the *centripetal case,* when an object on the plane of extroversion is said to affect our senses, and finally to create an impression; (2) the *centrifugal case,* where the starting-point lies on the introverted plane; for instance, when it

is said that an act of will causes a change in the physical world: we want an apple and lift our arm to take it.

Common sense on the level of ingenuousness would not view the first case as an instance of a causal relation between mind and body, because it is not aware of any causality in this event. It would rather reconstruct it as follows: The eye, a mirror, or a camera, reflects outside objects. If endowed with awareness, the reflector could also become aware of the reflected objects, regardless of the degree of their distortion or the truth value of the mirroring process. The mirroring does not need to be ascribed to mental causes, and can be strictly physical, and the supervening coincidental awareness does not have to participate in the causality between the object and its image.

It is only on the plane of psychological and neurological science that the inquirer will assume in this case an interaction or relation between mind and body, because he is then confronted with some final neurological datum—that is, a datum on the extrospective plane—and a "following" introspective datum (a sensation) which is added to the former as a new additional element. But the datum is obviously not additional on the extroverted plane (here it is non-existent); it exists only on the introverted plane (but here there is no extrospective or neurological datum). So how can they be "added"? "Two" data emerge only if one says that the final neurological datum is being "transformed" into or "followed" by a perceptive element. But there is no "transformation" and no "following" of one datum "after" another. The moment called that of "transformation" is the moment of the epistemic shift from extro- to introspection; it is the moment of the tacit and illicit change of direction and of method of inquiry. This means that the neurological datum may be doubled or split spatially into two, and a fictitious causality created between the extro- and the introspective datum, although the direction of inquiry was thereby upset and changed while merely one single datum was inspected once externally and then "felt" internally. The neurologist always has only one datum, the extrospective one, and the psychologist the sensation, or the introspective one; but neither of them has them together. The extrospector has an "object" but no perception, the introspector a "perception" but no object. Simultaneous use of the two methods will create a confusion, and cause the investigator to look after a causality operating not between two facts but two epistemic elements found by two divergent methods of inquiry, as though they were two addable facts.

The centrifugal case is the typical instance of the assumed mind-body relationship. We say that if we desire the apple, we

lift our arm and reach for it. Desire or the act of will "causes" the lifting of the arm. This would suggest that the act of will—a mental factor—is some energy force or power in the extrospectively experienced physical sense. This mental power, however, is unable to lift the apple without the intervention of the body, but the bodily organs themselves are also objects not easier to lift than other physical objects. A body (some machine) can lift an apple without act of will, but the latter will paradoxically never lift an apple without an arm. Thus the "act of will" looks like a gratuitous addition, while the arm is a necessary "intermediary." But why should the "act of will" not work directly on the apple, if it does so on the arm? One can not reason that the "will" is localized somewhere in the body, so as to establish a special relation between them, because all objections against the localization of the immaterial (spatiality) will apply.

The "act of will" is an introvertive duplication—meaningless in the world of facts—without the tools of prehension, and therefore a superfluous, ineffective cause. The facts are these: On the level of ingenuous action we are not aware of using our hands. This disjunction between action and awareness of our hands arises only when we look at our hands as we do on other objects, so that they are no longer the unconscious tools of action, but become "objects," parts of the extrospected world, the visible tentacles of function. On the level of ingenuousness the act of will and the use of our hands is one indissoluble function, which is broken up into an abstract immaterial function—the introspective datum—and into the object "hands"—the observational datum—due to our ability simultaneously to extrospect and introspect, that is, to function and to be aware of it, and to see our hands. When that happens, a bifurcation arises between the function and its corporeal carrier which is gratuitous and artificial. Thus we get the introspective idea of an act of will and of a bodily tool linked to it in causal relationship. And this is once more the fictitious relationship between the introspective and the extrospective data.

The act of will is a mental or introspective datum, or rather a construction abstracted from the fact that actions or functions are accompanied by awareness, which is then projected into a sort of manager of action. But the construction fails to explain how acts of will are able to perform services that neither "feelings" nor "thoughts"—also mental data—could ever perform. Knowledge *qua* knowledge is not a cause. For instance, the knowledge that there is an apple on the tree does not affect that apple. The mere fact of knowledge does not necessarily imply the assumption of a relation between mind and body. The whole doctrine of causal

efficiency of acts of will rests therefore on the age-old theory of the compartmentation of "the mental" into "thoughts," feelings, and acts of will, since only the latter are presumed to be in immediate relation with the material world. If that conception should turn out to be an epistemic illusion, then the mainstay of the celebrated relationship between mind and body would vanish. But even the compartmentation can not save the act of will from its mental nature, and the logical objection to the idea that something immaterial (i.e., nothing from the material point of view) will perform an act of physical force, can not fail to apply here.

Our body is the subject of function, but also the object of observation; and because it can be and becomes an object of observation, we look at it as if it were also an object of function, which it is not, being its subject. We then construct between the invisible parts of the function-process of which we are aware and its visible parts—that is, some parts of the body—a causal relationship, as though the latter were an object of function, which is only the world outside the body. This creates an illusive epistemic situation whose main instance is the mind-body relation. The whole situation involves a shift of perspective from introspection to extrospection and *vice-versa,* during the process of investigation, and this unnoticed shift creates the error and the duplication of facts. We are faced with two aspects of the same reality, according as to whether we use our eyes or our introspective capacity; but we use simultaneously these two sources of knowledge in the course of one indivisible investigatory process. In this process the body assumes the character of an object of function, as would other material things, and the fictitious relation between function and body emerges with a fictitious causality as a link between them. The function becomes a free-floating abstract entity, with the body as its object, on which the function is supposed to exercise its activity. "The immaterial" is the function detached from its visible substratum and erected into a subject, while the substratum becomes an object.

It is clear on the basis of this discussion that no introspective knowledge can ever provide a real criterion for the truth value of extrospection, nor can extrospective knowledge provide a criterion for the truth of introspection. They move in different directions, they move apart from each other and never meet. It is even difficult to conceive how introspection and extrospection could yield such criteria in their own respective fields. The criteria of truth thus far advanced are at the utmost some rules that have stood their ground against practical tests in their own fields of application. But this means only that the rule has worked suc-

cessfully. It is also clear that the age-old quarrel between idealism and realism loses most of its substance in the light of the epistemological views advanced in this discussion.

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BOOK NOTES

Robert Boyle, Devout Naturalist: A Study in Science and Religion in the Seventeenth Century. MITCHELL SALEM FISHER. Philadelphia: Oshiver Studio Press. 1945. 184 pp.

Boyle's youthful dream was the pious aspiration that in the physico-chemical laboratory he could find the evidences for the natural reasonableness of Christianity. Theological considerations occupy a large portion of the writings of many outstanding scientific contemporaries of Boyle (1627–1691), e.g., Van Helmont, Descartes, Pascal, Leibniz, Spinoza, Newton. Mitchell Fisher has done a splendid and thorough study of the relations of Boyle's scientific attainments to his religious interests and activities. While the late Louis T. More did an equally thorough historical study of the life, times, and work of Robert Boyle (published only a year before Mr. Fisher's), there is a clearer apprehension of the logical difficulties of Boyle's "natural religion" in the present work than in More's. So long as the warfare between science and theology remains alive, and it appears to be very much alive in the writings of philosophical scientists and theologians today, the historical study of the major efforts to establish a peace or even a truce between the two will be of interest to the student of the mind, whether he be called a historian of ideas or a philosopher.

The reader of this JOURNAL, as a philosopher, will be less concerned about the chronological and causal history of Boyle's ideas —though Mr. Fisher's account leaves very little untouched here (I have been able to note only the absence of the Leibniz-Boyle correspondence and the influence of Hooke's mechanical skill and knowledge on Boyle)—than in the tenability of Boyle's resolution of the conflict between his Mechanical Philosophy and his Anglicanism. The former explains only the *phenomena* of Nature through a few simple principles of matter and motion (the atoms of simple elements and the mathematical rules of their combination in mixtures or chemical compounds). The ultimate Plan and moving Spirit of the cosmic engine can not be known but can be intimated by mechanical science. Only a higher reason, such as we find elaborated in neo-Platonism, can focus the rays of the supernal light

of the Creator. An absolute dualism of phenomena and noumena, matter and spirit, mechanism and purpose, of things in and above discourse, pervades Boyle's religious philosophy of science.

He attacked the "double-truth" doctrine that an opinion could be true philosophically or scientifically but false theologically, and *vice versa*. "There can be no real conflict between them because God is the Author both of the Book of Nature and the Book of Revelation" (p. 31). The truths above discourse which theology teaches are not verifiable by experimental philosophy, but are not contrary to it (p. 155). The use of the mechanical, corpuscularian philosophy does not commit us to the atheism of the Epicureans; nor should we fall into the Catholic dogmas of papal infallibility and transubstantiation in order to reconcile the truths of sense with those of right reason. As in the case of Galileo there were political reasons as well as doctrinal ones for the placing of some of Boyle's works on the *Index Purgatorius*.

Now what are the possibilities in this hoary question of the relationship between science and religion? Boyle's attempted reconciliation not only denies the double-truth doctrine but also denies the following alternatives:

(1) Science yields no truth at all, but only useful fictions about nature. Religious philosophy alone can reveal truth.

(2) Science yields truths which are inferior to those of the higher knowledge of theology; the latter alone can tell us the truth about values.

(3) Science has the only basis or means for getting at truths that are verifiable; it is neutral with respect to moral or religious values that are not verifiable.

It would take us far from Boyle's devout naturalism to discuss the arguments adduced by different schools of thought on behalf of these views. The battle-ground today is no longer the political issue of popery in England, nor the reconcilableness of science and holy scriptures (cf. Archbishop Tillotson's argument to reconcile bodily resurrection with the practises of cannibals [pp. 93–94]). The issue today is joined on the question of method and its political and cultural implications, namely, on the rival claims of totalitarian authoritarianism, mystical intuitionism, metaphysical a priorism, and scientific empiricism, or pragmaticism in Peirce's sense.

Mr. Fisher's historical study explains why Boyle, who did so much to advance experimental science and method, balked at the extension of that method to "higher" things. Boyle's belief in the immutability and simplicity of the ultimate elements and laws

of nature runs over into his rational theology. We want to learn from the history of thought how logical errors come to be so deeply rooted in the habits of thinking of even our best scientists. Of these errors the failure to distinguish methodological from ontological postulates as well as the diverse components of religious attitude, dogma, and institutional hold over the individual's conduct, characterizes the controversy between science and religion. Mr. Fisher's solid study of the mind of Robert Boyle throws a great deal of light on the multiplicity of socio-historical and methodological considerations that enter into the perennial problem of adjusting established beliefs with the results and methods of experimental inquiry.

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The Development of Mathematical Logic and of Logical Positivism in Poland between the Two Wars. (Polish Science and Learning, No. 6.) Z. JORDAN. New York: Oxford University Press. 1945. 47 pp. $.85.

This is a very useful and readable account of Polish contributions to logic and the philosophy of science since about 1910. The scope and importance of Polish work in these fields is still unfamiliar to most Anglo-American students, and the author has rendered them a genuine service in preparing this clearly written outline of significant Polish accomplishments. He supplies informative background material for the so-called Lwow-Warsaw and Cracow schools of logic, and summarizes the major achievements of their outstanding members. Especially full notice is given to the contributions to pure logic of Lukasiewicz, Chwistek, Lesniewski, and Tarski. Of particular interest to philosophers who are not specialists in mathematical logic are the sections in the pamphlet devoted to Polish positivism and the writings of Kotarbinski and Ajdukiewicz, its chief exponents; and there is a suggestive account of Polish critiques of positivist analyses. A good though incomplete bibliography of relevant publications by Polish logicians and philosophers is also included.

E. N.

[29] (Footnote referred to on page 551.) A discussion of "The Aim and Progress of Psychology" by Professor J. R. Kantor (*American Scientist*, Vol. 34, 1946, pp. 251–263) published after the present paper was written, may be examined with profit. It stresses the modern "integrated field stage" of science, with special reference to psychology, in contrast with the earlier "substance-property" and "statistical-correlation" stages.